

**APPLICATION FOR
UNITED STATES LETTERS PATENT**

[0001] Be it known that we, Liran B. Cohen, a citizen of Israel, residing at 2410 F Dunwoody Crossing, Atlanta, Georgia 30338, and Alon Brand, a citizen of Israel, residing at 2410 F Dunwoody Crossing, Atlanta, Georgia 30338, have invented a new and useful "Chemiluminescent Vessel."

BACKGROUND OF THE INVENTION

[0002] The present invention relates generally to vessels and containers used in containing fluids. More particularly, this invention pertains to vessels used in consumer products which provide for novelty chemiluminescence by means of a two component reaction within sealed cavities of the vessel walls.

[0003] Alcohol is a favorite consumer beverage and is frequently served to the consumer in venues with reduced lighting, such as eating, drinking and dancing establishments. In such venues ambience is a critical feature. Proprietors of such establishments try to match the features of food and drink to the desired ambience favored by their clientele. More youthful and energetic consumers favor establishments providing containerized beverages. It has long been recognized that these consumers find beverages more attractive, and the activity involved in

consuming such beverages more enjoyable, if the containers associated with such consumption are provided with a novel appearance.

[0004] Luminescence in vessels or containers for food or drink is known in the prior art. U.S. Pat. No. 5,171,081, issued to Pita, et al. on December 15, 1992, discloses a double walled plastic beverage container having a chemiluminescent fluid disposed within the wall cavity. Another chemiluminescent fluid is contained separately within a compressible toroidal tube in the upper rim of the container. When the rim is flexed the toroidal tube is compressed, causing the fluid contained therein to rupture a thin membrane separating the fluids and thereby produce a chemiluminescent reaction.

[0005] In U.S. Pat. No. 6,474,467, issued to Kurdian on November 5, 2002, a re-fillable plastic luminescing bottle is disclosed. The bottle incorporates an ampule having a frangible membrane separating the individual chemiluminescent fluids.

[0006] The tube, or ampule, of the prior art is relatively unprotected from crushing and thus is subject to premature activation caused by accidental or intentional crushing. Finally, the chemiluminescent novelty of the prior art container cannot be readily associated with a branded packaged beverage because and activation of the chemiluminescent is not necessarily linked to consumption of any particular beverage.

[0007] From the perspective of the prepackaged beverage field, especially the prepackaged alcoholic beverage field, the prior art chemiluminescent containers are of limited value.

[0008] What is needed is a sealable chemiluminescent container for packaging beverages having a system by which opening the sealable closure of the beverage container simultaneously activates the chemiluminescent reactants.

[0009] What is also needed is a sealable chemiluminescent container for packaging beverages having a means of protecting the compressible tube commonly used for activating the chemiluminescent reactants.

[0010] What is finally needed is a method of selecting beverages and chemiluminescent components and, then, assembling the chemiluminescent containers so that the chemiluminescent light can be used to provide information regarding a characteristic of the beverage.

SUMMARY OF THE INVENTION

[0011] A chemiluminescent vessel is constructed from a first portion having a sealable inner container held by an outer container, the outer container forming a walled cavity between the inner and outer container, and which contains a first chemiluminescent fluid. A second portion of the vessel abuts the first portion and includes a compressible toroidal tube or capsule which defines a sealed tube cavity containing a second chemiluminescent fluid. A frangible barrier, preferably

comprising the tube wall, separates the tube cavity from the walled cavity. A fluid, such as a beverage, is contained in an inner cavity of the inner container. The sidewall of the second portion terminates in a neck that has a fluid opening. Preferably, the neck sidewall is contiguous with the sidewall of the inner container.

[0012] A removable protective cap assembly is formed from an inner cap contained within and rigidly attached to an outer cap. The inner cap forms a sealed closure with the neck of the inner container. The outer cap extends to overlay the second portion of the vessel so as to form a protective barrier which shields the compressible toroidal tube from accidental compression. In a preferred embodiment, removal of the protective cap causes a compression tab to engage and compress the tube sufficiently to rupture the frangible barrier. The first and second chemiluminescent fluids mix within the wall cavity producing a chemiluminescent reaction concurrent with the unsealing of the inner container containing the beverage.

[0013] Advantageously, the first and second chemiluminescent fluids are selected to produce, when mixed, a specific color connoting a characteristic of the beverage contained in the inner container.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] Fig. 1, 1A and 1B are cross-sectional views of one embodiment of the chemiluminescent vessel of the present invention, with Fig. 1A being an enlarged

partial view of the embodiment of Fig. 1 and Fig. 1B being the embodiment of Fig. 1 showing the cap assembly removed.

[0015] Fig. 2 is an under-side view of the cap assembly of the embodiment shown in Fig. 1.

[0016] Fig. 3 is a over-head view of the inner and outer containers of the embodiment shown in Fig. 1.

[0017] Figs. 4A, 4B, and 4C are cross-sectional views of three embodiments of the chemiluminescent vessel of the present invention, each view showing details of the toroidal tube and common upper rim of one embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] Referring now to Figure 1, a chemiluminescent vessel 10 is shown.

The vessel 10 comprises a first or lower portion constructed to form a double walled container 12 having an inner perimeter defined by inner sidewall 20a and an outer perimeter defined by outer sidewall 20b. Container 12 is shaped and adapted such that the portion of the container topographically within the inner sidewall 20a defines an inner fluid cavity or reservoir 22, adapted to contain a fluid 100, such as a beverage. A sealed walled cavity 24 is disposed within the double walled container 12 between inner sidewall 20a and outer sidewall 20b and contains a first chemiluminescent fluid 110.

[0019] Referring now to Figures 1, 1A, 1B and 3, vessel **10** comprises a second or upper portion **14** having a sidewall **30** contiguous with inner sidewall **20a** of first portion **12**. Sidewall **30** forms a shoulder **30a** where it meets inner sidewall **20a**. The sidewall **30** terminates in a neck **32**, which defines a fluid opening **33**. The neck **32** has exterior lands **34** adapted to receive a closure device, such as by threaded engagement. The sidewall **30** and inner sidewall **20a** are preferably composed of a translucent material that is a yieldingly deformable material as well. Suitable materials include extruded plastics adapted for drinking containers. Other suitable materials include glass, hard plastics and metals suitable for beverage containers. Still other suitable materials would be obvious to one skilled in the art. Where the vessel **10** is intended to contain fluids **100** other than beverages, other suitable materials adapted to contain the intended fluid would be obvious to one skilled in the art.

[0020] A compressible tube **40** is disposed at or adjacent to the base of wall **30**, where it meets inner sidewall **20a** at shoulder **30a**. The compressible tube **40** is formed with a tube wall **42** which is frangible along at least a portion **42a** of its circumference; more particularly, frangible portion **42a** of tube wall **40** is that portion which will permit fluid communication between the interior of compressible tube **42** and sealed wall cavity **24**. The interior of the compressible tube **40** defines a sealed tube cavity **44**, which contains a second chemiluminescent fluid **120**. The frangible barrier **42a** separates the tube cavity **44** from the wall cavity **24**. A

removable, protective cap assembly 50 is shown in Figures 1 and 1A received on the second portion 14 of the vessel 10. The protective cap assembly 50 includes a sidewall 50a which forms a protective barrier which shields the compressible tube 40 from accidental or premature compression.

[0021] As shown in Figure 2, the protective cap assembly 50 includes a structure adapted to compress the tube 40 during removal of the protective cap assembly 50 from the vessel 10. In this embodiment the compression structure is a compression tab 52, although other structures serving the same function could be substituted for the compression tab 52. Rotational removal of the protective cap assembly 50 causes the compression tab 52 to engage and compress the tube 40 sufficiently to rupture the frangible barrier 42a. Upon rupture of the frangible barrier 42a, the first chemiluminescent fluid 110 and the second chemiluminescent fluid 120 mix within the wall cavity 24.

[0022] In the embodiment shown in Figure 1, the protective cap assembly 50 is adapted to form a rotatably separable closure with vessel 10 so as to contain the fluid 100 within the vessel 10. The invention contemplates use of a removable closure, such as a lid, sealably spanning the inner perimeter 20a of vessel 10.

[0023] The mixing of the first and second chemiluminescent fluids 110, 120 following rupture of the frangible barrier 42a results in a chemiluminescence reaction. The chemiluminescence reaction occurs within the wall cavity 24 and produces light without producing significant heat. Thus, the chemiluminescent

vessel 10 may be safely handled during the chemiluminescence reaction without the need for protecting a user from heat. The color of the light produced by the reaction is dependent upon the specific chemicals used to make the components of the reaction, i.e. the specific first and second chemiluminescent fluids 110, 120 employed. Any of a number of colors of light can be selectively produced in a chemiluminescence reaction by selecting the corresponding reactant chemicals as the first and second chemiluminescent fluids 110, 120. Chemiluminescent fluids which can be used in connection with the present invention are well known. Preferably, the first chemiluminescent fluid is an oxalant such as, for example, the oxalant ester present as a solution in the selected propylene glycol vihydrocardyl ethyl solvent. The oxalant may include the solvent and the fluorescent or just the solvent. The second chemiluminescent fluid comprises the activator capable of providing the desired chemiluminescent effect when combined with the oxalant in a manner well known in the prior art and may include any of a number of well-known, readily, commercially available activators.

[0024] The outer sidewall 58 of double walled container 15 is constructed of a translucent material to permit the luminescence to be perceived. Suitable translucent materials would include translucent glass and translucent plastics. More preferably, the outer sidewall 58 and inner sidewall 57 are each formed from a yielding deformable material, such as extruded plastics commonly used with beverage containers.

[0025] Figure 1 shows a compressible, interrupted toroidal tube **40** monolithically formed with the frangible barrier **42a**. As noted, the interior of the interrupted tube **40** forms a sealed toroidal tube cavity **44** which contains a second chemiluminescent fluid **120**. The frangible barrier **42a** separates the wall cavity **24** and the toroidal tube cavity **44**. The interrupted toroidal tube **40** is recessed from the top of outer sidewall **20b** and extends along a circumferential portion of the inner sidewall **20a**.

[0026] A removable protective cap assembly **50** is shown having an outer cap wall **50a** and an outer cap top **50b**. The outer cap wall **50a** is received over the second portion **14** of vessel **10** and is adapted to form a protective barrier over the toroidal tube **40**. The protective cap assembly **50** further includes a compression tab **52** adapted to compress the interrupted toroidal tube **40** upon the removal of the protective cap assembly **50**. This compression is sufficient to cause the frangible barrier **42a** to rupture and to allow the first and second chemiluminescent fluids **110**, **120** to mix and produce a chemiluminescent reaction. In the embodiment shown in Figure 1, an upper end **20b'** of outer sidewall **20b** is adapted to receive the protective cap assembly **50** so as to form a sealable closure at the outer sidewall **20b**. In this embodiment the protective cap assembly **50** is rotatably removable from vessel **10** so as to form a rotatably separable closure. One type of closure means employed by an alternative embodiment of the invention comprises exterior lands attached to the upper end **20b'** and further comprises interior lands of the

outer cap wall received by such exterior lands. It would be obvious to one skilled in the art to employ another known method to form closures.

[0027] In another embodiment of the invention, illustrated in Figure 4A, a toroidal tube 40 of this embodiment is disposed beneath a common upper rim 25 of inner sidewall 20a and outer sidewall 20b, and maintained in place by ledges 25a and 25b and within sealed wall cavity 24. In this embodiment, common upper rim 25 is formed from a flexible plastic material such that the common upper rim 25 is readily deformable. The toroidal tube 40 is formed with a frangible wall barrier 42, but is separate from the common upper rim 25. The frangible barrier 42 separates the wall cavity 24 and the toroidal tube cavity 44. The frangible barrier 42 is disposed directly below the flexible common upper rim 25 such that sufficient deformation of the flexible common upper rim 25 will cause the frangible barrier 42 to rupture. In this embodiment, the outer wall 20b of vessel 10 can be formed from a hard plastic. The termination of the outer wall 20b provides a cap 50 receiving area 21. In this embodiment, the frangible barrier 42 and the flexible common upper rim 25 extend upwardly beyond the termination of the outer wall 20b and the cap receiving area 21. In variations of this embodiment, cap receiving area 21 can receive an outer cap wall 51a, which forms a protective barrier.

[0028] Referring now to Figure 4B, an embodiment incorporating the features of the embodiment of Figure 4A is shown. In this embodiment a protective outer collar 26 is disposed upon the outer wall 20b at the termination with the common

upper rim 25. The protective outer collar 26 is made of a hard material such as hardened plastic and forms a portion of the protective barrier. In one variation of this embodiment the height of the protective outer collar 26 is such that the protective outer collar 26 extends upwardly beyond the frangible barrier 42 and the flexible common upper rim 25 such that the protective outer collar 26 provides a complete lateral shield. In another variation of this embodiment the height of the protective outer collar 26 is such that the protective collar 26 extends upwardly but not beyond the frangible barrier 42 and the flexible common upper rim 25 such that the protective outer collar 26 provides a partial lateral shield. In other variations of this embodiment, the protective outer collar 26 provides a cap receiving area for receiving an outer cap wall 51a, which forms another portion of the protective barrier. In yet other variations of this embodiment, a portion of the outer cap wall 51a extend downwards beyond the top of the protective outer collar 26.

[0029] Referring now to Figure 4C, an embodiment incorporating the features of the embodiment of Figure 4B is shown. In this embodiment a protective inner collar 28 is disposed upon the inner wall 20a at the termination with the common upper rim 25. The protective inner collar 28 is made of a hard material such as hardened plastic. In one variation of this embodiment the height of the protective inner collar 28 is such that the protective inner collar 28 extends upwardly beyond the frangible barrier 42 and the flexible common upper rim 25 such that the protective inner collar 28, together with the protective outer collar 26, provides a

channel containing and shielding the frangible barrier 42 and the flexible common upper rim 25. In another variation of this embodiment the height of the protective inner collar 28 is such that the protective inner collar 28 extends upwardly but not beyond the frangible barrier 42 and the flexible common upper rim 25.

[0030] Referring now to Figure 3, an overhead view of the chemiluminescent vessel 10 is shown. A compressible toroidal tube 40 defines a sealed second component cavity 44. The interrupted toroidal tube 40 extends radially outward along the inner sidewall 20a along the shoulder 30a. The interrupted toroidal tube 40 extends along an arc around the perimeter of the sidewall 20a. The arc spans less than 360 degrees, thus showing an interruption in the toroidal shape of the tube 40. A remnant arc 130 is shown and is defined as equaling the arc of a circle less the span of the arc of tube 40.

[0031] Figure 3 further shows a tab receiving area 36 extending radially outward over the shoulder 30a. The tab receiving area 36 extends along the remnant arc 130 around the perimeter of the inner sidewall 20a. The second or upper portion 14 of the vessel 10 is shown in Figure 3. The sidewall 30 is shown terminating in a neck 32 defining a fluid opening 33. The neck 32 is shown having exterior lands 34.

[0032] Referring now to Figure 2, an underside view of the cap assembly 50 is shown. The cap assembly 50 includes an inner cap 55. The inner cap 55 extends downward from the inner cap top 50b. Interior lands 54 are shown attached to the

inner cap 55 for mating with the exterior lands 34 of the neck 32 of vessel 10 so as to form a threaded rotatably separable closure.

[0033] Referring now to Figures 1, 1A, 1B and 2, a compression tab 52 is shown attached to the outer cap wall 50a into the tab receiving area 36. The cross-sectional view of Figures 1 and 1A shows that the compression tab 52 is disposed such that the interrupted toroidal tube 40 will mechanically interfere with movement of the compression tab 52 as the cap assembly 50 is twisted so as to open vessel 10 containing fluid 100. The removal of the protective cap assembly 50 from the chemiluminescent vessel 10 of the embodiment of the invention of Figure 1 has three simultaneously and interlocked functions: it opens the vessel 10 providing access to the fluid 100 in the inner cavity 22; it removes the protective barrier shielding the interrupted toroidal tube 40 from premature or unintentional compression; and it causes the compression tab 52 to compress the interrupted toroidal tube 40 sufficiently to rupture the frangible barrier 42a and produce a chemiluminescent reaction.

[0034] One novel aspect of this invention is the method of assembly of the embodiments shown in Figure 1. Referring again to Figures 2 and 3, it can be seen that the embodiment of this invention shown as assembled in Figure 1 must have proper alignment of the compression tab 52 of the cap assembly 50 to prevent compression of the interrupted toroidal tube 40 during assembly. Since the vessel 10 is rotatably opened, one method of assembly would suggest twisting the cap

assembly 50, and thus the inner cap 55, onto the neck 32. However, this would cause the compression tab 52 of the cap assembly 50 to rotate through and compress the interrupted toroidal tube 40 during this method of assembly.

[0035] This difficulty has been overcome by employing an additional embodiment of the current invention. In this embodiment, assembly is accomplished by first filling the inner cavity 22 with a selected fluid 100. The cap assembly 50 is positioned above and aligned such that the compression tab 52 is positioned above the tab receiving area 36 without extending over any portion of the interrupted toroidal tube 40. With the components properly aligned, pressure is applied to the cap assembly 50 sufficient to force the inner cap 55 to slide over the neck 32. Since the inner cap 55 and the neck 32 are composed of a yielding deformable material, the components elastically deform to allow the inner cap 55 to slide over the neck 32.

[0036] The chemiluminescent vessel 10 of the embodiment of Figure 1 has an inner fluid cavity 22 suitable for packaging a beverage fluid 100. Since the removable, protective cap assembly 50 is designed such that opening vessel 10 is necessarily simultaneous with compression of the interrupted toroidal tube 40 and rupture of the frangible barrier 42a, the beverage 100 must be placed in the inner cavity 22 during assembly of the chemiluminescent vessel 10. Thus, a user can safely assume that the presence of a light from chemiluminescent reaction upon opening the chemiluminescent vessel 10 signals the corresponding presence of the

originally packaged beverage (or other goods, such as a medicine) **100** within the chemiluminescent vessel **10**. This novel feature of the apparatus of this invention provides for a novel method of practicing the invention in the field of beverage delivery. The selection of the beverage **100** packaged in the chemiluminescent vessel **10** can be coordinated with the selection of the color of the chemiluminescence reaction through the selection of the chemical components comprising the first and second chemiluminescent fluids **110**, **120**. Thus the characteristic of color can be used to provide information regarding a characteristic of the packaged beverage **100**.

[0037] One example of using this novel method is coordinating the proof of an alcoholic beverage packaged within a particular chemiluminescent vessel **10** with the color of the chemiluminescent light produced by opening the chemiluminescent vessel **10**. In this exemplar method, the first and second chemiluminescent fluids **110**, **120** can be selected from a number of component chemiluminescent fluids to produce any of three chemiluminescent colors: green, blue and red. Similarly and by example, the alcohol content of the packaged beverage can be selected from **10** proof, **40** proof, and **100** proof. By matching each selectable color to a different selectable alcohol level, the color gives the consumer a visual signal of the alcohol content of a newly opened chemiluminescent vessel **10**. For example, green can be paired with **10** proof, blue can be paired with **40** proof, and red can be paired with **100** proof. Following this method, if an individual consumer who has been

provided an unopened chemiluminescent vessel **10** containing a beverage subsequently twists off the cap assembly **50** and observes a blue chemiluminescent light, that consumer knows that the beverage **100** contained within the vessel **10** has a **40** proof alcohol content.

[0038] Thus, in practicing this novel method, the methods of assembling the chemiluminescent vessel **10** further include the steps of selecting and providing the beverage **100** to be packaged in the chemiluminescent vessel **10** from a predetermined group of beverages. Next, a color is selected from a predetermined group of colors, each color of the group of colors corresponding to a separate beverage of the predetermined group of beverages. Then, selecting the first and second chemiluminescent fluids **110**, **120** from a predetermined group of chemiluminescent fluids, wherein the selected first and second chemiluminescent fluids **110**, **120** are adapted to reactively produce the selected color corresponding the selected beverage **100**. The appropriate components of a chemiluminescent vessel **10** containing the selected first and second chemiluminescent fluids **110**, **120** are then provided. The assembly of chemiluminescent vessel **10** so as to sealably package the selected beverage **100** proceeds as described above.

[0039] Other embodiments of this invention and methods of practicing the same are directed at other combinations of colors and beverages, such as soft drinks and sports drinks. Still other embodiments are directed at packaging consumer goods other than beverages, such as medicines, perfume, shampoo and mouthwash.

One skilled in the art will recognize that this invention and method of practicing the same may be modified for packaging fluids for use in various reduced visibility conditions.

[0040] Thus, although there have been described particular embodiments of the present invention of a new and useful Chemiluminescent Vessel, it is not intended that such references be construed as limitations upon the scope of this invention except as set forth in the following claims: